

We claim:

1. A system for determining hematocrit or hemoglobin concentration of blood, comprising:

a sampling device for collecting a blood sample; and

an analyzer adapted for insertion of said sampling device and for measuring and displaying hematocrit or hemoglobin concentration of said blood sample, said analyzer further comprising,

a signal generator for generating an electronic signal,

at least one transducer coupled to said pulse generator for converting the electronic signal to an ultrasonic signal, said transducer(s) being oriented toward an aperture in said sampling device for emitting the ultrasonic signal into the blood sample while still inside said sampling device, and for receiving ultrasonic reflections from said blood sample,

a receiver for measuring a physical parameter from said ultrasonic reflections, and

a processor for calculating any hematocrit or hemoglobin in said blood sample from said measured physical parameter.

2. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 1, wherein said aperture defines a test cell in said sampling device, and said at least one transducer covers said aperture when said sampling device is inserted in said analyzer.

3. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 2, wherein said sampling device includes a capillary channel for inducting a blood sample.

4. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 3, wherein said analyzer comprises a micro-pump for pumping said blood sample from said capillary channel into said test cell.

5. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 1, wherein said analyzer comprises pivoting door having a pocket for insertion of said sampling device, and for pivoting said sampling device into a test chamber in said analyzer.

6. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 5, wherein said door is spring-biased open.

7. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 6, further comprising a latching mechanism for latching said pivoting door shut.

8. The apparatus for determining hematocrit or hemoglobin concentration of blood

according to claim 7, wherein said latching mechanism comprises a stationery undercarriage and slidable carriage mounted on said undercarriage.

9. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 7, further comprising an electronically controlled-unlatching mechanism for unlatching said door.

10. The apparatus for determining hematocrit or hemoglobin concentration of blood according to claim 9, wherein said unlatching mechanism includes a shape memory alloy.

11. An apparatus for determining hematocrit or hemoglobin concentration of blood, comprising:

a sampling device for acquiring a blood sample, said sampling device comprising a body having a finger-grip at one end and an opposing functional end, said functional end further including a collecting region including an entrance aperture through which fluid enters the device by capillary action and flows into said collecting region, a testing region in fluid communication with said collecting region for containing said fluid during testing inside said analyzer, and a pumping region in fluid communication with said testing region for introducing a pressure-differential and thereby inducting said fluid from said collecting region into said testing region for testing; and

an analysis unit comprising a sample port for insertion of said sampling device, a signal generator for generating electronic signals, at least one transducer coupled to said pulse generator and oriented toward the testing region on said sampling device for

emitting ultrasonic signals through the blood sample while in said sampling device in accordance with said electronic signals, and for receiving ultrasonic reflections from said blood sample, a temperature probe for measuring temperature of said blood sample, a receiver for measuring a physical parameter from said ultrasonic reflections, and processor for calculating any hematocrit or hemoglobin in said blood sample from said measured physical parameter.

12. The fluid sample collection device according to claim 11, wherein said pumping region comprises a bulb for introducing said pressure-differential.

13. The fluid sample collection device according to claim 11, wherein said pumping region comprises an orifice for coupling a pump in said analyzer to said testing region for introducing said pressure-differential.

14. The fluid sample collection device according to claim 13, wherein said bulb is operated by insertion of said collection device into said analyzer and squeezing thereof during insertion.

15. The fluid sample collection device according to claim 13, wherein said bulb is operated by squeezing via an actuator in said analyzer.

16. The fluid sample collection device according to claim 13, wherein said testing region

comprises an open-ended chamber that is sealed by insertion between sensor walls of said analyzer.

17. A blood analysis device, comprising:

A disposable blood sampling device having means for collecting a fluid sample by capillary action, and means for transporting said fluid to a testing cell by pressure-differential for testing by an analyzer; and

an analyzer unit into which said disposable fluid sampling device may be inserted for measuring time of flight of ultrasound through the blood sample whilst still in said disposable sampling device and for calculating hematocrit or hemoglobin in said blood sample from said measured physical parameter.

18. A method of self-testing an analyzer for determining hematocrit or hemoglobin concentration of blood as described in claim 1, comprising the steps of:

placing a calibrated test fluid in a sampling device and recording an expected physical parameter directly on said sampling device;

inserting said sampling device into said analyzer with said test fluid contained therein;

measuring and displaying a physical parameter from ultrasonic reflections therein;

and

calculating and displaying an actual physical parameter from said calibrated test fluid at said analyzer for comparison by a user to the expected physical parameter recorded on said sampling device.

19. A disposable blood sampling device for use in conjunction with an analyzer as described in claim 1, comprising a capillary tube with an inlet aperture for drawing a test fluid into said sampling device, said capillary tube being substantially vertically-oriented when inserted into said analyzer, and a testing cell in fluid communication with said capillary tube.

20. A calibration sampling device for use in conjunction with an analyzer as described in claim 1, comprising a capillary tube for drawing a test fluid into said sampling device, said capillary tube being horizontally oriented when inserted into said analyzer, and a testing cell in fluid communication with said capillary tube.